What is claimed is:

1. A microfluidic optical system comprising:

a light source;

a light receiver;

a microfluidic device for altering, by light-fluid interaction, the nature of a light beam emitted by the light source, the device having a window that is substantially transmissive of a desired light spectrum and containing a plurality of fluids behind the window, the window being disposed in an optical path between the light source and the light receiver to permit light-fluid interaction; and

means for repeatedly manipulating the proportion of at least one of the plurality of fluids optically disposed between the light source and light receiver, wherein the manipulation affects reflection, refraction, absorption, optical filtering, or scattering of the light beam by at least one of the plurality of fluids.

2. The system of claim 1 wherein the manipulation means includes a flow control device that permits the flow rate of at least one fluid of the plurality of fluids to be varied.

3. The system of claim 1 wherein the plurality of fluids includes a first fluid and a second fluid, and the manipulation means includes microfluidic layering means that permit the first fluid to contact the second fluid in overlapping fluid layers behind the window.

4. The system of claim 3 wherein the thickness of at least one fluid layer may be varied.

5. The method of claim 1, further comprising a mixer for substantially mixing at least two of the plurality of fluids, wherein the light beam interacts with the resulting mixture.

6. The system of claim 1 wherein the manipulation step serves to selectively enable light emitted from the light source to be received by the light receiver.

7. The system of claim 1 wherein the plurality of fluids include a first fluid and a second fluid, the fluids being substantially immiscible and defining a discrete plug of the first fluid, and the manipulation means includes a deformable flexible member in fluid communication with the first fluid plug.

8. The system of claim 7 wherein the flexible member is deformed by means selected from the group consisting of: piezoelectric actuation, magnetic actuation, pneumatic actuation, thermoelectric actuation, and mechanical actuation.

9. The system of claim 7 wherein the first fluid and the second fluid are both liquids.

10. The system of claim 1 wherein at least one of the plurality of fluids contains dissolved or suspended particles.

11. The system of claim 1 wherein the manipulation means is automated.

12. The system of claim 1 wherein the light source provides a collimated beam, a monochromatic beam, or a laser beam.

13. A variable optical filter including the optical system of claim 1.

14. An optical switching device including the optical system of claim 6.

15. An optical processing system comprising:

an input light source;

an input coupler for receiving light from the first light source;

an output coupler for providing light to an output device;

a microfluidic optical device for manipulating light, the fluidic optical device being optically coupled between the input coupler and the output coupler; and

an output device for receiving a beam from the output coupler.

16. The system of claim 15 further comprising:

a first optical element for manipulating light, the first element being optically coupled with the input coupler; and

a second optical element for manipulating light, the second element being optically coupled with the output coupler,

wherein the first and second optical element are each optically coupled to the fluidic optical device.

17. The system of claim 16 wherein the first and the second optical element are selected from the group consisting of: lens, optical filter, collimator, mirror, and beam splitter.

18. The system of claim 16 wherein the system is integrated into a single optical apparatus.

19. The system of claim 15 further comprising a controller and a power supply.

20. The system of claim 19 further comprising a sensor, wherein the controller receives a feedback signal from the sensor.

21. The system of claim 15 wherein the input source provides a monochromatic beam.

22. A method for performing optical switching, the method comprising the steps of:

providing a first light source and a first light receiver;

providing an enclosed microfluidic channel containing a first fluid and a second fluid, the fluids being substantially immiscible and defining a discrete plug of the first fluid; and

manipulating the first fluid plug to selectively enable light emitted from the first light source to be received by the first light receiver.

23. The method of claim 22 wherein an actuator is used to manipulate the first liquid plug.

24. The method of claim 22 wherein manipulation of the first fluid plug is performed by deforming a flexible member in fluid communication with the microfluidic channel.

25. The method of claim 22 wherein the first liquid plug is manipulated by inducing an electrokinetic or electrophoretic pressure gradient within the channel.

26. The method of claim 24 wherein a fluid reservoir having a greater cross-sectional area than the microfluidic channel is in fluid communication with the microfluidic channel, and the flexible member is positioned adjacent to the reservoir.

27. The method of claim 24 wherein the flexible member defines a surface of the microfluidic channel.

28. The method of claim 22 wherein a second light receiver is provided, the method further comprising the step of manipulating the first fluid plug to selectively enable light emitted from the first light source to be received by the second light receiver.

29. A method for performing optical switching, the method comprising the steps of:

providing a light source and a light receiver;

providing an enclosed microfluidic channel containing a fluid;

providing a deformable member in fluid communication with the channel, and

deforming the deformable member to displace at least a portion of the fluid contained in the microfluidic channel to selectively enable light emitted from the light source to be received by the light receiver.

30. The method of claim 29 wherein the fluid is substantially absorptive of at least a portion of the spectrum to be emitted from the light source, and the deformable member is substantially reflective of at least a portion of the spectrum to be emitted from the light source.

31. The method of claim 29 wherein the fluid is substantially reflective of at least a portion of the spectrum to be emitted from the light source, and the deformable member is substantially absorptive of at least a portion of the spectrum to be emitted from the light source.

32. The method of claim 29 wherein the deformable member is deformed by means selected from the group consisting of: piezoelectric actuation, magnetic actuation; thermoelectric actuation, mechanical actuation, and pneumatic actuation.

33. An optical switching device utilizing the method of claim 29.

34. A method for altering the nature of a light beam, the method comprising the steps of:

providing an enclosed microfluidic device having a chamber bounded by a deformable flexible membrane, the chamber containing fluid;

supplying a light beam to the microfluidic device in the direction of the flexible membrane; and

manipulating the pressure within the chamber, thereby deforming the flexible membrane and changing the amount of fluid present in the chamber.

35. The method of claim 34 wherein the flexible membrane is substantially transmissive of a desired light spectrum and at least a portion of the light beam interacts with the fluid contained in the chamber.

36. The method of claim 34 wherein the flexible membrane is substantially reflective of a desired light spectrum and at least a portion of the light beam interacts with the membrane.

37. A system for altering the nature of a light beam, the device comprising:

a light source;

a microfluidic chamber containing a fluid, and bounded by a deformable flexible membrane;

supplying a light beam to the microfluidic device to be received by the flexible membrane; and

manipulating the pressure within the chamber, thereby deforming the flexible membrane and changing the amount of fluid present in the chamber.

38. A method for performing optical switching, the method comprising the steps of:

providing a first microfluidic optical device disposed in a first device layer;

providing a second microfluidic optical device disposed in a second device layer;

supplying a light beam to the first microfluidic optical device; and

manipulating the first device to selectively transmit at least a portion of the light beam to the second microfluidic optical device.

39. The method of claim 38 wherein the first device layer is disposed in a first plane, and the second device layer is disposed in a second plane that is parallel to the first plane.

40. The method of claim 38 wherein the second device layer is a curvilinear surface.

41. The method of claim 40, further comprising the steps of:

providing a third microfluidic optical device disposed in the second device layer; and

manipulating the first device to selectively transmit at least a portion of the light beam to the third microfluidic device.